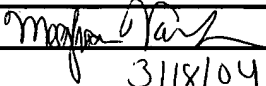



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<b>TRANSMITTAL FORM</b>  (to be used for all correspondence after initial filing)	Application Number	10/694,687	
	Filing Date	October 27, 2003	
	First Named Inventor	Nikolai Ledentsov	
	Art Unit	2811	
	Examiner Name		
Total Number of Pages in This Submission	109	Attorney Docket Number	QIL-1DIV

ENCLOSURES (Check all that apply)		
<input type="checkbox"/> Fee Transmittal Form	<input type="checkbox"/> Drawing(s)	<input type="checkbox"/> After Allowance communication to Technology Center (TC)
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<input type="checkbox"/> Express Abandonment Request	<input type="checkbox"/> Terminal Disclaimer	8 references
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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
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CERTIFICATE OF TRANSMISSION/MAILING	
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This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

THE COMMISSIONER OF PATENTS AND TRADEMARKS

Alexandria VA 22313-140

In re Application of: Nikolai Ledentsov  
Serial No. 10/694,687  
Filed: October 27, 2003  
For: Semiconductor Device and Method of Making Same  
Examiner:  
Art Unit: 2811  
Attorney Docket No.: QIL-1DIV

**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**

**List of Sections Forming Part of This Information Disclosure Statement**

The following sections are being submitted for this information Disclosure Statement

1. ☒ Preliminary Statements
2. ☒ FORM PTO - 1449 (Modified)
3. ☐ Statement As To Information Material To Examination Not Found in Patents or Publications
4. ☒ Identification of Prior Application In Which Listed Information Was Already Cited and For Which No Copies Are Submitted Or Need Be Submitted.
5. ☐ Cumulative patents or Publications
6. ☒ Copies of Listed Information Items Accompanying This Statement
7. ☐ Concise Explanation of Non-English Language Listed Information Items.
8. ☐ Translation(s) of Non-English Language Documents
9. ☐ Certification under MPEP 609(e)
10. ☒ Identification of Person(s) Making This Information Disclosure Statement

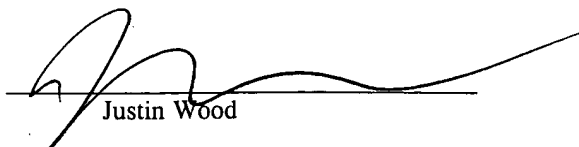
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**CERTIFICATE OF MAILING**

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Justin Wood

## **Section 1. Preliminary statements**

Applicant submits herewith patents, publications or other information of which he is aware, which he believes may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 CFR 1.56.

The filing of this information disclosure statement shall not be construed as a representation that a search has been made (37 CFR 1.56(g)), an admission that the information cited is, or is considered to be, material to patentability or that no other material information exists.

The filing of this information disclosure statement shall not be construed as an admission against interest in any manner. Notice of January 9, 1992, 1135 O.G. 13-25, at 25.

## **Section 2. Form PTO - 1449 (Modified) (SEE ATTACHMENT)**

\*EXAMINER: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw a line through citation if not in conformance or not considered. Include a copy of this form with the next communication to applicant.

## **Section 3. Statement As To Information Material For Examination Not Found in Patents or Publications (Information not listed in PTO 1449)**

## **Section 4. Identification of Prior Application in Which Listed Information Was Already Cited and For Which No Copies Are Submitted Or Need Be Submitted**

**09/851,730**

**Attorney docket no: QIL-1**

**Ledentsov et al.**

**5/09/01 (Items AA-BF already submitted)**

## **Section 5. Cumulative Patents or Publications**

☐ Item(s)

are cumulative of the following patents or publication listed on Form PTO 1449 (modified):

In accordance with 37 CFR 1.98(c) a copy of \_\_\_\_\_ is being submitted with this information disclosure statement.

## **Section 6. Copies of Listed Information Items Accompanying This Statement**

Legible copies of all items listed accompany this information statement.

☐ Exception(s) to above:

☐ Items in prior application from which an earlier filing date is claimed for this application as identified in Section 4.

☐ Cumulative patents or publications identified in Section 5.

## **Section 7. Concise Explanation of Non-English Language Listed Information Items**

## **Section 8. Translation(s) of Non-English Language Documents**

☐ Submitted herewith is an English translation of the following foreign language patents, publications or information or of those portions of those patents, publications or information

considered to be material:

☐ No English language translations of the foreign language patents, publications or information or parts thereof are readily available, except for those listed above.

☐ The following foreign language documents submitted are believed to be the equivalent or substantial equivalent of the English language documents identified below, which are also submitted herewith.

## Section 9. Certification under Rule 1.97

☐ The undersigned hereby certifies that:

a. This Statement is being filed after the latest of (1) three months after the filing date of a national application; (2) three months after the date of entry of the national stage as set forth in w 1.491 in an international application; (3) the mailing date of a first Office action on the merits.

b. The fee set forth in §1.17(p)

☐ Is being paid with this Information Disclosure Statement

☐ Is not due because:

☐ (1) Each item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the statement, or

☐ (2) No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the statement.

## Section 10. IDENTIFICATION OF PERSON(S) MAKING THIS INFORMATION DISCLOSURE STATEMENT

The person making this statement is

(a) ☐ the inventor(s) who signs below

(b) ☒ the attorney who signs below on the basis of:

☐ the information supplied by the inventor(s)

☐ an individual associated with the filing and prosecution of this application (37 CFR 1.56(c)).

☒ the information in the attorney's file



Meghan Van Leeuwen, Registration No. 45,612

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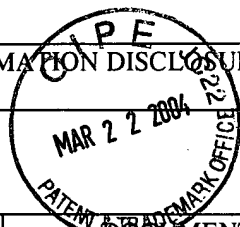
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## Section 2. Form PTO - 1449 (Modified) (ATTACHMENT)

FORM PTO-1449 U.S. DEPT. OF COMMERCE (Modified) PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. QIL-1DIV	SERIAL NO. 10/694,687
	APPLICANT Ledentsov	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	FILING DATE 10/27/03	GROUP 2811



## U.S. PATENT DOCUMENTS

Exam Initial		DOCUMENT NUMBER	DATE	PATENTEE	CLASS	SUB	FILING DATE IF APPROPR
				See Attached			
	BG	5,210,051	05/11/93	Carter Jr.	437	107	
	BH	5,290,393	03/01/94	Nakamura	156	613	
	BI	5,306,662	04/26/94	Nakamura et al.	437	107	
	BJ	5,741,724	04/21/98	Ramdani et al.	437	182	
	Bk	5,838,029	11/17/98	Shakuda	257	190	
	BL	5,928,421	07/27/99	Yuri et al.	117	97	
	BM	5,972,801	10/26/99	Lipken et al.	438	770	
	BN	6,087,681	07/11/00	Shakuda	257	103	
	BO	6,153,010	11/28/00	Kiyoku et al.	117	95	
	BP	6,160,833	12/12/00	Floyd et al.	372	96	
	BQ	6,177,688	01/23/01	Linthicum	257	77	
	BR	6,194,742	02/27/01	Kern et al.	257	94	
	BS	6,287,947	09/11/01	Ludowise et al.	438	606	
	BT	6,498,111	12/24/02	Kapolnek et al.	438	762	
	BU	6,582,986	06/24/03	Kong et al.	438	48	
	BV	6,534,797	03/18/03	Edmond et al.	257	97	
	BW	6,537,513	03/25/03	Amano et al.	423	328.2	
	BX	6,602,763	08/05/03	Davis et al.	438	481	
	BY	6,627,974	09/30/03	Kozaki et al.	257	623	
	BZ	6,627,520	09/30/03	Kozaki et al.	438	479	
	CA	6,630,691	10/07/03	Mueller-Mach et al.	257	84	
	CB	6,630,692	10/7/03	Goetz et al.	257	94	
	CC	2002/0046693	04/25/02	Kiyoku et al.	117	8	
	CD	2003/0037722	02/27/03	Kiyoku et al.	117	84	
	CE	2003/0160232	08/28/03	Kozaki et al.	257	22	
	CF	5,482,890	01/09/96	Liu et al.	437	107	
	CG	5,888,885	03/30/99	Xie	438	493	

## FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

Exam Initial		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB	TRANSLATION YES   NO

## OTHER PRIOR ART

Exam Initial		Author, Title, Date, Pertinent Pages, Etc
	CH	J.L. Liu, C.D. Moore, G.D. U'Ren, Y.H. Luo, Y. Lu, G. Lin, S.G. Thomas, M.S. Goorsky, K.L. Wang; "A surfactant-mediated relaxed Si <sub>0.5</sub> Ge <sub>0.5</sub> graded layer with a very low threading dislocation density and smooth

		<i>surface</i> ", Applied Physics Letters, Vol. 75 (11), pp. 1586–1588 (1999).
	CJ	Y. Takano, K. Kobayashi, H. Iwahori, N. Kuwahara, S. Fuke, S. Shirakata; "Low temperature growth of InGaAs layers on misoriented GaAs substrates by metalorganic vapor phase epitaxy", Applied Physics Letters, Vol. 80 (12), pp. 2054–2056 (2002).
	CK	M.J. Manfra, N.G. Weimann, J.W.P. Hsu, L.N. Pfeiffer, K.W. West, S.N.G. Chu; "Dislocation and morphology control during molecular-beam epitaxy of AlGaIn/GaN heterostructures directly on sapphire substrates"; Applied Physics Letters 81 (8), pp. 1456–1458 (2002).
	CL	O. Conteras, F.A. Ponce, J. Christen, A. Dadgar, A. Krost; "Dislocation annihilation by silicon delta-doping in GaN epitaxy on Si"; Applied Physics Letters 81 (25), pp. 4712–4714 (2002).
	CM	A.D. Capewell, T.J. Grasby, T.E. Whall, E.H.C. Parker; "Terrace grading of SiGe for high quality virtual substrates"; Applied Physics Letters 81 (25), pp. 4775–4777 (2002).
	CN	"Vertical-Cavity Surface-Emitting Lasers: Design, Fabrication, Characterization, and Applications"; by C.W. Wilmsen, H. Temkin, L.A. Coldren (editors), Cambridge University Press, 1999
	CO	N.N. Ledentsov, V.A. Shchukin; "Novel Concepts for Injection Lasers", Optical Engineering, Vol. 41 (12), pp. 3193–3203 (2002).
	CP	N.N. Ledentsov et al., "1.3 um Luminescence and Gain From Defect-Free InGaAs-GaAs Quantum Dots Grown By Metal-Organic Chemical Vapor Deposition." Semicond. Sci. Technol. 15, 2000, pp. 604-607
EXAMINER		DATE CONSIDERED



Section 2. Form PTO - 1449 (Modified) (ATTACHMENT)

FORM PTO-1449 U.S. DEPT. OF COMMERCE (Modified) PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. QIL-1	SERIAL NO.
	APPLICANT Ledentsov	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	FILING DATE 05/04/01	GROUP

U.S. PATENT DOCUMENTS

Exam Initial		DOCUMENT NUMBER	DATE	PATENTEE	CLASS	SUB	FILING DATE IF APPROPR
	AA	4,806,996	02/21/89	Luryi, S.	357	16	
	AB	5,019,874	05/28/91	Inoue et al	357	16	
	AC	5,075,744	12/24/91	Tsui, R.K.	357	22	
	AD	5,091,767	02/25/92	Bean et al	357	60	
	AE	5,156,995	10/20/92	Fitzgerald Jr., et al	437	90	
	AF	5,208,182	05/04/93	Narayan et al	437	110	
	AG	5,719,894	02/17/98	Jewell et al	372	45	
	AH	5,859,864	01/12/99	Jewell, J.	372	45	
	AI	5,927,995	07/27/99	Chen et al	438	517	
	AJ	5,960,018	09/28/99	Jewell et al	372	45	

FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

Exam Initial		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB	TRANSLATION YES   NO
	A						

OTHER PRIOR ART

Exam Initial		Author, Title, Date, Pertinent Pages, Etc
	AK	Chen, Y. et al, 1995, "Nucleation of misfit dislocations in In <sub>0.2</sub> Ga <sub>0.8</sub> As epilayers grown on GaAs substrates", Appl. Phys. Lett 66 (4) 499-501
	AL	Huffaker, D.L. et al, 1998, "1.3 μm room-temperature GaAs-based quantum-dot laser", Appl Phys. Lett. 73 918), pp 2563-3566
	AM	Blum, O. et al, 2000, "Characteristics of GaAsSb Single-Quantum-Well-Lasers Emitting Near 1.3 μm", IEEE Photonics Technology Letters, Vol. 12, No. 7, pp 771-773.
	AN	Nakahara, K. et al, 1998, "1.3 μm Continuous-Wave Lasing Operation in GaInAs Quantum-Well Lasers", IEEE Photonics Technology Letters, Vol 10, No. 4, pp 487-488.
	AO	Schlenker, D. et al, 1999, "1.17 μm Highly Strained GaInAs-GaAs Quantum-Well Laser", IEEE Photonics Technology Letters, Vol 11, No. 8, pp. 946-948
	AP	Lee, B. et al, 1996, "Optical properties of InGaAs linear graded buffer layers on GaAs grown by metalorganic chemical vapor deposition" Appl. Phys. Lett. 68 (21), pp 2973-2975
	AQ	Roan, E.J. et al, 1991, "Long-wavelength (1.3 μm) luminescence in InGaAs strained quantum-well structures grown on GaAs", Appl. Phys. Lett. 59 (21), pp 2688 2690.
	AR	Herman, M.A. et al, 1991, "Heterointerfaces in quantum wells and epitaxial growth processes: Evaluation by luminescence techniques" J. Appl. Phys. 70 (2), pages 52

AS	Elman, B. et al, 1989, "In situ measurements of critical layer thickness and optical studies of InGaAs quantum wells grown on GaAs substrates", Appl. Phys. Letter. 55 (16), pp 1659-1661.
AT	Alferov, Zh. et al, 1971, "Investigation of the Influence of the AlAs-GaAs Heterostructure Parameters on the Laser Threshold Current and The Realization of Continuous Emission at Room Temperature", Soviet Physis – Semiconductors, Vol. 4, No. 9, pp 1573-1575
AU	Alferov, Zh. et al, 1970, "AlAs—GaAs Heterojunction Injection Lasers With A Low Room-Temperature Threshold", Soviet Physis – Semiconductors, Vol. 3, No. 9, pp 1107-1110
AV	Gourley, P.L. et al, 1988, "Controversy of Critical Layer Thickness for InGaAs/GaAs strained-layer Epitaxy", Appl. Phys. Lett. 52 (5), pp 377-379.
AW	Tsang, W.T., 1981, "Extension of lasing wavelenghts beyond 0.87 $\mu\text{m}$ in GaAs/ $\text{Al}_x\text{Ga}_{1-x}\text{As}$ double-heterostructure lasers by In incorporation in the GaAs active layers during molecular beam epitaxy", Appl. Phys. Lett. 38 (9), pp 661-663
AX	Hayashi, I. et al, 1970, "Junction Lasers which Operate Continuously At Room Temperature", Applied Physics Letters, Vol. 17, No. 3, pp 109-111
AY	Goldstein, L. et al, 1985, "Growth by molecular beam epitaxy and characterization of InAs/GaAs strained-layer superlattices", Appl. Phys. Lett. 47 (10), pp 1099-1101
AZ	Beanland, R. et al, 1997, "Relaxation of strained epitaxial layers by dislocation rotation, reaction and generation during annealing", Inst. Phys. Conf. Ser. No. 157, pp 145-148
BB	Glas, F. et al, 1987, "TEM study of the molecular beam epitaxy island growth of InAs on GaAs", Inst. Phys. Conf. Ser. No. 87: Section 2, pp 71-76
DATE CONSIDERED	



## Section 2. Form PTO - 1449 (Modified) (ATTACHMENT)

FORM PTO-1449 U.S. DEPT. OF COMMERCE (Modified) PATENT AND TRADEMARK OFFICE	ATTY DOCKET NO. QIL-1	SERIAL NO. 09/851,730
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	APPLICANT Nikolai Ledentsov	
	FILING DATE May 9, 2001	GROUP 2823

## U.S. PATENT DOCUMENTS

Exam Initial	DOCUMENT NUMBER	DATE	PATENTEE	CLASS	SUB	FILING DATE IF APPROPR

## FOREIGN PATENT OR PUBLISHED FOREIGN PATENT APPLICATION

Exam Initial	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB	TRANSLATION YES   NO

## OTHER PRIOR ART

Exam Initial		Author, Title, Date, Pertinent Pages, Etc
	BC	Scott A. McHugo and William D. Sawyer 'Impurity decoration of defects in float zone and polycrystalline silicon via chemomechanical polishing" Applied Physics Letters (1993) Volume 62, Issue 20, pp. 2519-2521
	BD	B. Shen, X. Y. Zhang, K. Yang, P. Chen, R. Zhang, Y. Shi, Y. D. Zheng, T. Sekiguchi and K. Sumino 'Gettering of Fe impurities by bulk stacking faults in Czochralski-grown silicon" Applied Physics Letters (1997) Volume 70, Issue 14, pp. 1876-1878
	BE	M. Herrera Zaldivar, P. Fernandez, and J. Pique 'Study of defects in GaN films by cross-sectional cathodoluminescence" Journal of Applied Physics (1998) -Volume 83, Issue 5, pp. 2796-2799
	BF	Ledentsov, N. N. "Long-Wavelength Quantum-Dot Lasers on GaAs substrates: From Media to Device Concepts" IEEE Journal of Selected Topics in Quantum Electronics, Vol. 8, No. 5, September/October 2002 pp. 1015-1024
EXAMINER		DATE CONSIDERED